

**Assessing the Impact of Cultural Beliefs on the Use of Evidence-Based Treatment  
for Diarrhea in Developing Countries: A Systematic Review**

A thesis submitted to the University of Arizona College of Medicine – Phoenix  
in partial fulfillment of the requirements for the degree of Doctor of Medicine

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Class of 2018

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## **ACKNOWLEDGEMENTS**

I would like to thank my mentor, Dr. Patrick Connell, for his guidance in developing the research question and completing the systematic review. I would also like to thank Dr. David Beyda, Director of the Global Health Program, and Dr. Matthew McEchron, Director of Scholarly Projects, for their assistance throughout the course of this project.

## **ABSTRACT**

Diarrhea is the fourth leading cause of death in children under five worldwide. Extensive research has been done to determine the best treatment plans for diarrhea. Recommendations for diarrhea treatment include oral rehydration therapy, continued feeding, zinc supplementation, and antibiotic use if indicated. The use of these therapies is lower than expected in developing countries. This study aims to determine how cultural beliefs can impact the use of evidence-based approaches for treatment of diarrhea in developing countries. A systematic review of primary research articles was done to assess knowledge of and attitudes towards evidence-based treatments, analyze care-seeking behaviors, and identify beliefs attached to treatment practices. The data showed that most cultural beliefs fall into the following themes: misconceptions about evidence-based treatments; feeding practices; home remedies and herbal medicines; inappropriate use of medications; and traditional healers and spiritual beliefs. The results show the possibility for working with traditional healers and the local population to gather more data about beliefs and practices. This information can be used to develop culturally sensitive treatment programs that can operate within the framework of local beliefs and practices.

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## **CHAPTER 1: SYSTEMATIC REVIEW**

## INTRODUCTION

Diarrhea is the fourth leading cause of death in children under five worldwide. From 2000-2013, the proportion of deaths due to diarrhea in children under five decreased by over 30%.<sup>1</sup> However, diarrhea is still a condition afflicting children around the world today. According to a UNICEF and WHO report from 2009, over 80% of deaths due to diarrhea occur in Africa and South Asia.

Diarrhea is caused by a variety of pathogens including rotavirus, *E. Coli*, *Shigella*, *Campylobacter*, *Salmonella*, and *V. cholerae*. Pathogens are transmitted from the stool of an infected person to the mouth of another. If the water lost through the stool is not replenished, this can lead to a fatal outcome. Thus, the main cause of death from diarrhea is due to dehydration. Children are especially susceptible to diarrhea if they have poor nutrition and health. They are at a greater risk for dehydration since water constitutes a larger proportion of their body weight.<sup>2</sup>

Extensive research has been done regarding cost-effective methods to treat diarrhea in developing countries. Evidence-based therapies include oral rehydration therapy, continued feeding, zinc tablets, and antibiotics in the case of dysentery. Oral rehydration salts are encouraged for fluid replenishment in cases of diarrhea. Packets of oral rehydration salts are widely available and caregivers can prepare a solution containing these salts at home. This is considered the gold standard for diarrhea treatment. In the event that oral rehydration salts are not available, fluid solutions can be made using low cost ingredients. Such recommended home fluids include cereal-based drinks and breast milk (for infants). It is highly recommended that children with diarrhea continue to receive regular meals. Children who maintain their nutritional status are more likely to survive from diarrheal episodes.<sup>3</sup> A relatively new therapy in diarrhea treatment is zinc tablets. Zinc allows for proper immune system functioning and is crucial for overall development. Diarrhea depletes zinc stores, so replenishing zinc in the body can help in fighting off the diarrhea-causing pathogen. Zinc has been shown to improve the effectiveness of ORS, so a combination of zinc and ORS therapies can be useful in treating diarrhea.<sup>4</sup>

Despite the proven interventions to treat diarrhea, morbidity and mortality due to this condition is still high. One of the reasons behind this high incidence and prevalence of diarrhea is the lack of implementation of therapies in communities around the world. As of 2015, only 49% of children under five with diarrhea receive oral rehydration therapy or recommended home fluids. <sup>1</sup> Africa has the lowest treatment coverage, followed by South Asia, the Middle East, and North Africa. Children who live in rural areas and those from poorer households are less likely to receive treatment for diarrhea. <sup>2</sup>

There are many non evidence-based therapies used by communities in developing countries to treat diarrhea. These include traditional medicines, herbal medicines, and inappropriate antibiotic use. Other barriers to use of evidence-based medicine include incorrect information regarding treatment, as well as cultural beliefs that contradict WHO recommendations. The WHO and UNICEF have outlined goals to increase coverage of evidence-based diarrhea treatment. One of these goals is to “change behaviors through community involvement, education, and health-promotion activities.” <sup>2</sup> In order to modify community behaviors, it is essential to understand community beliefs.

This study assesses how cultural beliefs impact the use of evidence-based therapies in areas with high rates of diarrhea and diarrhea-related deaths.

## **METHODS**

### ***Databases***

The databases used to gather data for this systematic review were PubMed, Embase, Web of Science, and Scopus. Additional articles were selected through the Anthropology Plus database, as well as through citations of papers that were included in the study.

### ***Keywords and Search Terms***

The keywords used to search for articles were the following: diarrhea/diarrhoea, developing countries, treatment, beliefs, attitudes, knowledge, practices, culture, healers, fluid therapy, ORT, ORS, and zinc. The search strings and article yield for each search is given in Appendix A.

### ***Article Selection***

All searches were limited to papers published since 2000. Search results were screened by title and abstract. Studies not relevant to the research question were excluded. After title and abstract screening, the remaining papers were assessed for eligibility according to the inclusion and exclusion criteria. The inclusion criteria were articles discussing primary research, articles originally published in English, and articles that used caregivers of children under five as part of the study population. Studies that discussed protection or prevention strategies for diarrhea (rotavirus and measles vaccinations, early and exclusive breastfeeding, vitamin A supplementation, effective hand washing, improved water supply quantity and quality, and community-wide sanitation promotion) were not included in the analysis.

### ***Data Analysis***

Articles were analyzed and information was entered into a table to catalog each study for the systematic review. Information collected from each article was as follows: country/region of study, publication year, type of study, population studied, and a narrative description of beliefs that caregivers held. After data was entered into the table, a descriptive analysis of cultural beliefs was conducted.

## RESULTS

The total article yield after database searching and individual article selection was 2317. After screening the titles and abstracts of all the articles, 111 were relevant to the research question. The 111 were then assessed for eligibility. Articles were excluded because they were not in English, not available in full text, did not present primary research, discussed protection/prevention strategies instead of treatment, and did not have a study population of caregivers of children. 26 articles remained and were used for the systematic review (Figure 1). The articles in the systematic review had studies from 20 countries. Countries with the highest representation were India (n = 3) and Kenya (n = 3). Many of the articles used interviews, surveys, and questionnaires to gather data (Table 1).

The 26 studies describe beliefs that fall into 5 themes: misconceptions about evidence-based treatments; feeding practices; home remedies and herbal medicines; inappropriate use of medications; and traditional healers and spiritual beliefs (Figure 2). The themes and article distribution in each are discussed in detail below.

### ***Misconceptions About Evidence-Based Treatment***

There were 9 articles that discussed caregivers' misconceptions of evidence-based treatments. This included lack of knowledge of ORT, erroneous beliefs of the effects of ORT, and errors in assessing severity of illness.

### ***Feeding Practices***

There were 6 articles that reported feeding practices that contradict WHO recommendations. Specific practices were cessation of food, fluids, and/or breast milk during diarrhea. Others included modification of foods that were given to children by caregivers.

### ***Home Remedies and Herbal Medicines***

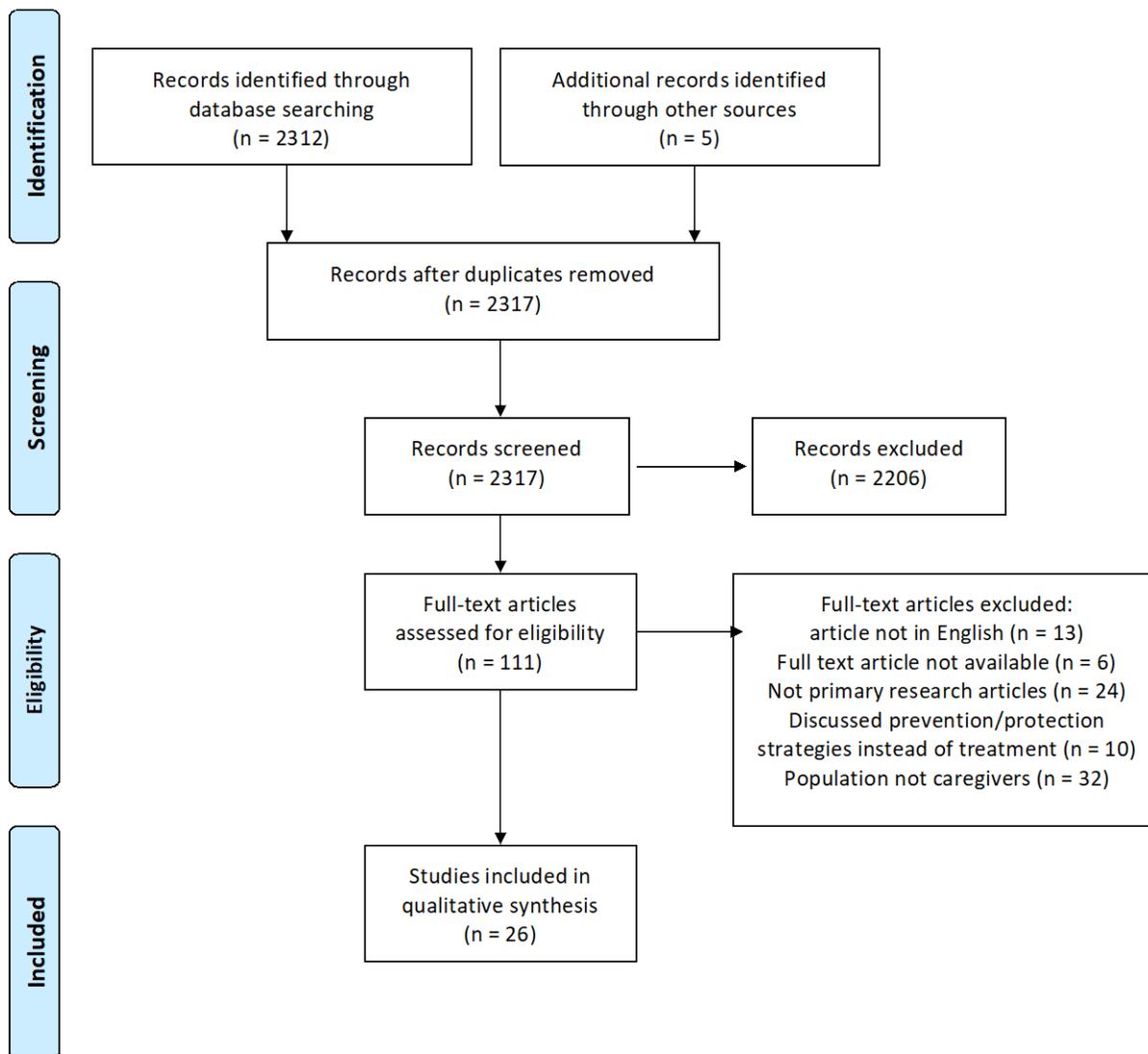
Six articles reported that caregivers preferred home remedies for diarrheal illness in their children. Therapies given included herbal teas, coconut oil, and root/plant/leaf extracts.

### ***Inappropriate Use of Medications***

Eight articles reported inappropriate use of medications, such as anti-motility agents, antibiotics, and antipyretics. These medications were acquired from market vendors or



## PRISMA 2009 Flow Diagram



**Figure 1:** PRISMA Flow Diagram Showing Process for Article Selection for Systematic Review

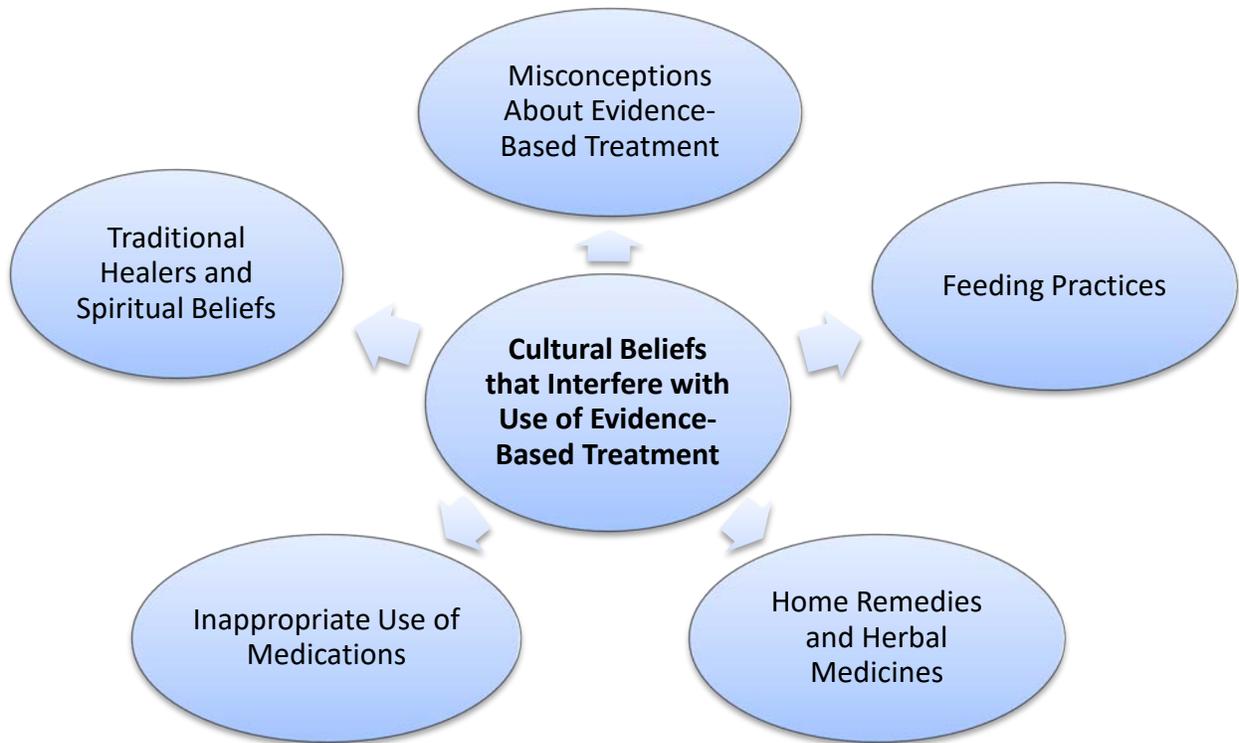
**Table 1: Cultural Beliefs and Treatment Practices for Diarrhea in Developing Countries**

Author	Year	Country or Region	Sample Size (n)	Study Type	Description of Cultural Belief/Practice
Pacheco et. al	2011	Bolivia	725	Cluster randomized trial; Surveys	Vernacular term (" <i>k'echalera</i> ") that is used to describe changes in stool does not correspond with symptom-based definition, causing difficulty in determining proper course of treatment
Terra de Souza et. al	2000	Brazil	127	Questionnaires; interviews	Attempts to treat infant at home Seeking care from a traditional healer (" <i>rezadeira</i> ") for prayer and herbal teas or from lay pharmacist for antibiotics Maternal beliefs: infant was destined to die, illness was due to someone's evil or bad eye (" <i>mal ollhado</i> "), diarrhea was caused by a spiritual source Poor perception of disease severity
McLennan et. al	2002	Dominican Republic	582	Structured questionnaire	Restriction of greasy foods, cow's milk, rice, or beans during diarrheal episode Preference for herbal teas Belief that ORS can stop diarrhea Purchasing antibiotics from pharmacy without prescription
Edwards et. al	2008	Eastern Africa	5	Case report	Belief that removal of tooth buds (" <i>ebinyo</i> ") can treat diarrhea
Mediratta et. al	2010	Ethiopia	440	Case-control study; questionnaires	Withholding of food, fluids, breast milk
Sillah et. al	2013	Gambia	400	Structured questionnaire	Belief that teething can cause diarrhea Belief that breastfeeding and sexual behavior by mother early in breastfeeding period can cause diarrhea Lack of knowledge on how to prepare ORS solutions

Heuveline et. al	2000	Guatemala	2556	Questionnaires; interviews	Use of antipyretics, analgesics, anti-diarrheals based on recommendations from mothers or relatives
Lamberti et. al	2015	India	2132	Cross-sectional household surveys	Perceived severity of diarrheal episode influences caregiver's decision to seek treatment (correlation between diarrhea care-seeking and dehydration, fever, vomiting, and higher stool frequency)
Pillai et. al	2003	India	469	Case control analysis; Cross- sectional survey	Perceived severity of diarrheal illness determines whether care is sought Use of non-allopathic providers and alternative medicines
Sreeramareddy et. al	2012	India	4438	Cluster study; surveys	Preference for home remedies
Macdonald et. al	2007	Indonesia	100	Cross-sectional surveys	Belief that ORS can stop diarrhea
Amini-Ranjbar et. al	2007	Iran	330	Cross-sectional study; questionnaires	Decreasing solid food during diarrhea episode Decreasing quality of food by omitting fat or egg Using lactose free milk and watery formula
Mukiira et. al	2013	Kenya	1656	Surveys; questionnaires	Buying medications from a chemist or using leftover medications found at home Rubbing soda mint on child's gums
Omore et. al	2013	Kenya	5839	Cross-sectional survey	Preference of antimicrobial and antimotility drugs
Otieno et. al	2013	Kenya	109	Structured questionnaire	Belief that zinc can only be given for diarrhea due to teething

Ellis et. al	2007	Mali	352	Structured interviews	<p>Belief that teething can cause diarrhea and thus there is no treatment</p> <p>Belief that diarrhea with a fever is caused by malaria, leading to seeking of anti-malarial drugs from healers</p> <p>Cessation of breastfeeding due to belief that diarrhea could be transmitted through mother's breast milk</p> <p>Home treatment consisting of leaves, root, and bark broth</p> <p>Use of antibiotics purchased from market vendors</p> <p>Belief that certain complicated forms of diarrhoea (those accompanied by either blood in the stool or vomiting) could only be cured with traditional medicines</p>
Taffa et. al	2005	Nairobi	3015	Structured questionnaires	Severity of disease determines treatment course
Ansari et. al	2012	Nepal	20	Focus group discussions and interviews	<p>Belief that certain diarrheas require adopting traditional/superstitious methods like exorcism</p> <p>Belief that there is no role of ORS and enough water in diarrhea due to teething</p> <p>Belief that some diarrheas require massage to the whole body of the child with caraway seeds or garlic boiled in edible oil</p> <p>Belief that breast milk is harmful and should be stopped during diarrhea</p>
Adegboyega et. al	2005	Nigeria	495	Cross-sectional community survey	Treatment with drugs purchased from local medicine stores/pharmacies prayers, self-treatment, and traditional home care
D'souza et. al	2003	Pakistan	222	Case control study	Use of traditional/faith healers

Ecker et. al	2013	Peru	1200	Cross-sectional study; Surveys	Belief that antibiotics are required for treatment of diarrhea
Kristiansson et. al	2008	Peru	798	Cross-sectional study; structured questionnaire	Self-medication with antibiotics
Kanu et. al	2014	Sierra Leone	244	Cross-sectional study; structured questionnaire	Lack of knowledge that child should be given more fluids during diarrhea Lack of knowledge on how to prepare ORS solutions Lack of knowledge that infants under 6 months should be breastfed during diarrhea
Friend-du et. al	2013	South Africa	206	Focus group discussions and interviews	Using a soap and water enema for treatment of diarrhea
Schaetti et. al	2010	Zanzibar	356	Cross-sectional study; interviews	Belief in magico-religious causes of diarrhea that required faith healers Preference of traditional and herbal remedies



**Figure 2:** Themes Identified Through Collection of Data

pharmacists, often without a prescription. These practices were tied to beliefs that all diarrheal episodes require medication-based treatment.

***Traditional Healers and Spiritual Beliefs***

There were 7 articles that described spiritual beliefs and care seeking from traditional healers. Caregivers who believed that diarrheas had supernatural cause tended to go to traditional healers for treatment. Examples of treatment provided by the healers include massage, rituals, and exorcism.

## DISCUSSION

The data reveal current treatment beliefs and practices in developing countries across the world. A descriptive analysis of each theme is provided below. There are various limitations to the systematic review. Some of these limitations include the lack of substantial public health data from developing countries and the small catalog of articles that address cultural beliefs and barriers to care. Another thing to consider is limitations of the individual studies themselves. The reliability of information presented in the articles may be variable. Since most of the data was collected through interviews, surveys, and discussions, it is possible that caregivers gave researchers the answers they thought would be most accepted rather than the truth. This facet is difficult to address, so this systematic review was run with the assumption that data presented in the articles was reliable and valid.

Analysis of the data showed commonalities and trends between countries. Each of the five themes had articles with data from various countries. The first theme was misconceptions about evidence-based treatments. One of the common misconceptions was that ORT would stop diarrhea. ORT replenishes fluids lost by diarrhea but does not treat the underlying cause/source. When caregivers tried ORT and found that it did not stop diarrhea, they believed that it was an ineffective treatment. Caregivers who had this experience were less likely to use ORT for their children in future episodes of diarrhea. Another common motif in misconceptions regarding diarrhea was not being able to assess the severity of diarrheal illness. Many caregivers thought that diarrhea was not serious and therefore did not seek treatment from health facilities. Erroneous beliefs about the causes of diarrhea also led to incorrect use of evidence-based treatments. Many caregivers believe that teething can cause diarrhea, and as such, does not require any treatment because it is transient. All these beliefs can be corrected through educational interventions.

The second theme dealt with feeding practices of caregivers. Harmful practices regarding feeding were cessation of breastfeeding, restriction of fluids, and reduced food intake. One limitation to this analysis was that it was not clear whether reduced feeding was due to reduced appetite by children or restriction of feeding by caregivers. In the latter case, education of caregivers regarding diarrhea treatment can help.

The third theme was home remedies and herbal medicines. Caregivers preferred to treat diarrheal episodes with natural therapies, such as herbal teas and root/plant extracts. They felt that these therapies could cure the cause of diarrhea, unlike ORT, which does not stop diarrhea. Educating the caregivers about the necessity of fluid replenishment during diarrhea may improve use of ORS. If the home remedies don't harm the child, they can be practiced in conjunction with evidence-based treatments.

The fourth theme was inappropriate use of medications. Many caregivers believe that effective treatment for diarrhea consists of medication pills, regardless of the etiology. Antibiotics are indicated for dysentery, but not for other types of diarrhea. The perception that all diarrheas should be treated with pills pushes caregivers to seek medications from sources such as pharmacists or medical vendors. Nearly all of these medications are obtained without a prescription. Education for both the caregivers and the medication providers can help in this regard.

The last theme was spiritual beliefs and use of traditional healers. This is the most challenging category of beliefs to deal with because they are not based on a lack of knowledge. Educational interventions can help with the four themes above, but education may not be useful in addressing spiritual beliefs. Caregivers who believed that diarrhea was caused by a supernatural force took their children to traditional healers or faith healers. In their eyes, only these individuals could cure diarrhea. Explaining evidence-based treatment to these caregivers may be futile. In this case, perhaps working alongside the traditional healers may work. Using the traditional/spiritual healers as bridges to connect with the local community may facilitate the transfer of knowledge in a way that is accepted by caregivers. Seeing traditional healers as possibilities for collaboration rather than opposing forces in the treatment of diarrhea may allow for the most effective approach to overcome cultural barriers to care.

## **CONCLUSION**

Diarrhea is a large cause of under-five mortality worldwide. The WHO has recommended the use of ORT, continued feeding, zinc tablets, and antibiotics in the case of dysentery. The use of these evidence-based treatments is still low. A systematic review of articles reveals cultural beliefs that interfere with the use of evidence-based approaches. These beliefs relate to misconceptions about evidence-based treatments; feeding practices; home remedies and herbal medicines; inappropriate use of medications; and traditional healers and spiritual beliefs. Many of these beliefs can be corrected through educational interventions. Spiritual beliefs are more difficult to overcome and more research is needed in this area. Working with traditional and spiritual healers can help develop culturally sensitive programs that can operate smoothly in the context of local beliefs and practices.

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## APPENDIX: Search Strings and Article Yields

<b>WEB OF SCIENCE</b>	
<i>Diarrhea developing countries treatment</i>	652
Diarrhea developing countries beliefs	42
Diarrhea developing countries attitudes	28
Diarrhea developing countries knowledge	166
Diarrhea developing countries practices	230
Diarrhea developing countries healers	12
Diarrhea developing countries fluid therapy	31
Diarrhea developing countries oral rehydration therapy	78
Diarrhea developing countries oral rehydration salts	27
Diarrhea developing countries zinc	245
<b>TOTAL</b>	<b>1511</b>
<b>Duplicates Removed</b>	<b>1046</b>
<b>SCOPUS</b>	
Diarrhea developing countries treatment	970
Diarrhea developing countries beliefs	20
Diarrhea developing countries attitudes	103
Diarrhea developing countries knowledge	193
Diarrhea developing countries practices	403
Diarrhea developing countries healers	10
Diarrhea developing countries fluid therapy	173
Diarrhea developing countries oral rehydration therapy	219
Diarrhea developing countries oral rehydration salts	23
Diarrhea developing countries zinc	245
<b>TOTAL</b>	<b>2359</b>
<b>Duplicates Removed</b>	<b>1452</b>

<b>PUBMED</b>	
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND treatment	315
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND beliefs	16
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND attitudes	23
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND knowledge	34
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND practices	22
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND healers	1
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND fluid therapy	48
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND oral rehydration therapy	56
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND oral rehydration salts	4
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND zinc	41
(("Diarrhea"[Mesh]) AND "Developing Countries"[Mesh]) AND ("Culture"[Mesh])	5
<b>TOTAL</b>	<b>565</b>
<b>Duplicates Removed</b>	<b>332</b>
<b>EMBASE</b>	
'diarrhea'/exp AND 'developing country'/exp AND treatment	375
diarrhea'/exp AND 'developing country'/exp AND beliefs	7
diarrhea'/exp AND 'developing country'/exp AND attitudes	4
diarrhea'/exp AND 'developing country'/exp AND knowledge	65
diarrhea'/exp AND 'developing country'/exp AND practices	52
diarrhea'/exp AND 'developing country'/exp AND 'fluid therapy'/exp	137
diarrhea'/exp AND 'developing country'/exp AND 'oral rehydration therapy'/exp	82
diarrhea'/exp AND 'developing country'/exp AND zinc	117
<b>TOTAL</b>	<b>839</b>
<b>Duplicates Removed</b>	<b>555</b>

## **CHAPTER 2: COMPREHENSIVE REVIEW**

## INTRODUCTION

Diarrhea is the 4<sup>th</sup> leading cause of mortality in children under five worldwide and accounts for 9% of under-five deaths. <sup>1</sup> Many cases of diarrhea-related deaths occur in developing countries, with greater than 80 percent in Africa and South Asia. <sup>2</sup> The World Health Organization (WHO) has issued a series of evidence-based recommendations for prevention and treatment of diarrhea, yet the global burden of disease due to this illness is still high. This review will discuss interventions for diarrheal disease and barriers to implementation in developing countries.

Diarrhea is defined as the passage of three or more loose and watery stools a day. It can be classified into the following three categories: (1) acute watery diarrhea, (2) bloody diarrhea, also referred to as dysentery, and (3) persistent diarrhea, which is illness lasting greater than 14 days. The main etiology of diarrheal illness is infection, with viral, bacterial, and parasitic causes. It is usually spread through fecal-oral transmission. Diarrhea leads to a loss of fluid, electrolytes, and nutrients from the intestines. Failure to replenish fluids can lead to severe dehydration, which is the main cause of diarrhea-related mortality. <sup>2</sup>

The diagnosis of diarrhea is based on clinical symptoms. In developing countries, it is common for caregivers to be able to identify when a child is having episodes of diarrhea. Recognizing symptoms that require immediate attention, however, is less common. These symptoms include dehydration, blood in the stool, profuse and persistent diarrhea, as well as vomiting in addition to diarrhea. Symptoms such as these require attention from health care workers.

## PREVENTION AND TREATMENT

The World Health Organization (WHO) has issued a seven-point plan for diarrhea control. The first point is fluid replacement to prevent dehydration. The gold standard for fluid replacement is oral rehydration salts (ORS), with a universal formula for all countries. If ORS is not available, recommended home fluids (RHF) – including cereal-based drinks made from rice, maize, potato, or other grains – may be used. <sup>2</sup>

The second treatment for diarrhea is zinc administration, which decreases severity and duration of illness. Zinc stores are depleted during diarrheal episodes and supplementation can replenish body's reserves. A 10-14 day treatment course reduces duration and severity of diarrheal illness, and zinc itself can increase uptake of oral rehydration salts. <sup>2</sup> In a review of 18 studies done in developing countries, zinc supplementation resulted in a reduction of diarrhea-related mortality by 18%. <sup>3</sup>

The rest of the seven-point plan focuses on prevention of diarrhea. Rotavirus is estimated to cause about 40% of hospital admission due to diarrhea in children under five worldwide, so vaccination can prevent diarrheal illness. The other prevention strategies are promotion of early and exclusive breastfeeding as well as vitamin A supplementation and promotion of hand washing with soap. 88% of diarrhea-related deaths are attributable to unsafe water and inadequate sanitation and poor hygiene. Areas to target on a community level include improvement of water supply quantity and quality, including treatment and safe storage of household water, and community-wide sanitation promotion. <sup>2</sup>

In cases of dysentery, the WHO recommends the use of antibiotics, specifically ciprofloxacin, ceftriaxone, and pivmecillinam. A systematic review of literature has shown that these specific antibiotics can prevent >99% of dysentery deaths if administered appropriately. <sup>4</sup>

## **BARRIERS TO TREATMENT**

While morbidity and mortality have decreased in the past few decades, there are still a large number of deaths attributable to diarrhea. Many children with diarrhea are still not being properly treated. Only 49% of children under five with diarrhea are receiving ORS <sup>1</sup> Only 37% of infants less than 6 months of age are exclusively breastfed. In children with diarrhea, only 33% receive ORS and continued feeding. <sup>5</sup>

### ***Caregiver Perceptions***

For children afflicted with diarrhea, caregivers are the key to proper treatment. Their beliefs about interventions for diarrhea can affect health outcomes. Studies have shown that in cases where caregivers sought treatment for diarrhea at a health facility, recommended feeding practices and ORS was not used. This may be due to the perception that services provided at a health facility, such as pills, syrups, and injections, are a replacement for and possibly superior to home therapies such as ORS and continued feeding. <sup>6</sup>

### ***Healthcare Worker Misconceptions***

Healthcare workers, including doctors, nurses, and community health workers, play a large role in the implementation of treatment recommendations. Misconceptions or inappropriate treatment practices can hinder the use of WHO recommendations. The introduction of zinc administration during diarrheal illness is relatively recent, and many healthcare workers are not aware of the benefits. Because of this, zinc is not given for most cases of diarrhea. <sup>7</sup> In a study in India, only 31% of doctors prescribed ORS, whereas antibiotics or other unnecessary drugs were given to 79% of patients. It is possible that ORS was not viewed as effective since it did not shorten illness duration or decrease stool output. <sup>7</sup> The perception that ORS and zinc are not medicines since they do not relieve diarrheal symptoms is dangerous because it leads to a tendency for providers to treat with antidiarrheal medicines, antibiotics, and local remedies. An assessment of practices in Benin showed that 84% of clinics whose health personnel had received training and education on zinc supplementation also recommended an antibiotic or antidiarrheal in addition to zinc. <sup>8</sup>

### ***Gaps in Policy***

Government policy is essential for implementation of diarrhea treatments on a wide scale. Examples of policy that would be beneficial are the incorporation of zinc and ORS into national guidelines and the addition of zinc to essential medication lists. Changing policy based on WHO recommendations is difficult and often requires a lot of time. Indonesia, for example, has enacted many diarrhea-related policy changes except for addition of zinc on the national essential medicine list, because the government wants to conduct its own safety trial on the drug. While ORS use has been widely accepted by many governments, zinc is still lagging in the policy changes. Zinc is included on only 15% of national essential medicines lists, and much more work needs to be done to make it a widely used treatment for diarrhea. <sup>8</sup>

## **FUTURE DIRECTIONS AND CONCLUSION**

Although diarrhea morbidity and mortality has decreased significantly, diarrhea is still a large contributor to deaths under five. The WHO's seven point plan for diarrhea control outlines an ideal approach to decreasing the incidence and severity of diarrhea in developing countries. Barriers to implementation of these steps can be attributed to caregiver perceptions, healthcare workers misconceptions, and gaps in policy. Further research in knowledge, attitudes, and health-seeking behaviors can help identify areas to target with education programs. Efforts to raise awareness amongst healthcare workers and empowering health personnel to enact change within their communities can increase the penetration of recommended treatments in developing areas. Advocacy on a national and international level is necessary for implementation of policy changes. Additional work within these arenas can help increase the efficacy of interventions and reduce the burden of diarrhea on health worldwide.

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